

Report of a Working Group on Forages

Ninth Meeting, 23-25 October 2007, Piešťany, Slovakia

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PART I. DISCUSSION AND RECOMMENDATIONS

Introduction

Opening welcome by local organizers

The Ninth Meeting of the Working Group (WG) on Forages of the European Cooperative Programme for Plant Genetic Resources (ECPGR) was opened at the Hotel Satelit, Piešťany, when Daniela Benediková, Plant Genetic Resources (PGR) National Coordinator of Slovakia, welcomed all the participants and introduced Ing. Stefan Adam, Director General of the Agriculture section of the Slovakian Ministry of Agriculture, and Dr Jan Kraic, director of the Research Institute of Plant Production (RIPP) of the Slovak Agricultural Research Centre.

S. Adam expressed his pleasure in welcoming the meeting to Slovakia and considered it very important that a meeting of the Forages WG was being organized by the Slovak Agricultural Centre in cooperation with Bioversity International for the first time. He stated that Slovakia is an agricultural country, with 50% of the land utilized as arable land (1.5 million ha). The crops which are the most widely grown are firstly cereals, and secondly forages such as clover and alfalfa, while other crops, including industrial crops, are grown to a lesser extent. The recent market liberalization has led to reduced agricultural production in Slovakia, but attention to PGR remains essential and Slovakia is happy to have established a PGR national programme, a genebank and appropriate legislation on genetic resources. He wished all the participants well and hoped that they would benefit from their attendance at the Ninth Meeting of the Forages WG.

Dr Jan Kraic was pleased to welcome all the participants to the small town of Piešťany and reminded the group that RIPP was established in 1951, and was initially focused on PGR of the main crops cultivated in Slovakia, with forages among these. Genetic resources efforts were greatly intensified at the end of the 1990s when the genebank was founded. Activities in forage PGR were closely related to forage breeding programmes and several cultivars of alfalfa, clover and bird's foot trefoil were registered as a result. RIPP is now an integral part of the Slovak Centre for Agricultural Research, which was created in 2006 by the pooling together several research institutes. The Centre operates within the framework of the Ministry of Agriculture and the research programme includes all the efforts related to management of PGR. He expressed his gratitude for the decision to organize the meeting in Piešťany, which is a well-known spa and health resort town, with the hope that it will soon also become well known as an important centre for PGRs. He concluded by conveying good wishes from Prof. Stefan Mihina, who could not be present for the welcoming address, and wished the attendees a successful and fruitful discussion and a pleasant stay in Piešťany.

Self-introduction of participants and approval of the agenda

Beat Boller, Chair of the Working Group, welcomed all the participants and was pleased to see a room so full of people and expectations. He asked the members to briefly introduce themselves. The agenda was then presented and approved with minor modifications.

Updates on ECPGR

L. Maggioni gave an introduction describing the ECPGR framework (www.ecpgr.cgiar.org). This cooperative programme is going through its VIIth Phase (2004–2008) of activities. The membership includes 38 countries, operating within six Crop Networks and three Thematic Networks. The 5-year budget is approximately 2.2 million euro.

The ECPGR Steering Committee (SC) has endorsed four priority areas for Phase VII: 1) Characterization and evaluation, 2) Task sharing, 3) *In situ* and on-farm conservation and 4) Documentation. The Steering Committee also requested a Network Coordinating Group (NCG) within each Network to define activities to be carried out, in consultation with all the Working Group members, on the basis of a budget of about 27 700 euro in the case of the Forages Network. The NCG was formed, composed of Beat Boller (Network Coordinator), Magdalena Ševčíková, Evelin Willner, Lajos Horváth, Valeria Negri, Petter Marum and Chris Kik (who replaced Loek van Soest in 2006).

The following activities were approved:

- NCG Meeting, April 2005, Lindau, Switzerland
- Ninth Meeting of the Forages WG, October 2007, Piešťany, Slovakia
- Report of the Ninth Meeting

At the mid-term SC meeting in Riga (September 2006), relevant decisions taken were the following:

- The current ECPGR four priority areas were all considered as relevant for the subsequent Phase VIII, but “Task sharing and capacity building” was indicated as the top priority for the next Phase;
- Networks will need to provide a list of proposed actions for Phase VIII, including clearly measurable targets;
- Recommendations were made to countries to ratify the International Treaty and to implement it;
- The name and acronym of the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) were changed to: European Cooperative Programme for Plant Genetic Resources (ECPGR).

According to a working document prepared by the SC, each NCG should submit proposals for project activities to be carried out in Phase VIII. The Forages Network budget should then be submitted with three possible financial scenarios (i.e. 100%, same budget level as in Phase VII \approx 28 000 euro; 115%, inflationary adjustment \approx 32 000 euro; and 125% \approx 35 000 euro). Up to 75% of the overall budget should be dedicated to meetings and 25% to actions. The proposed project activities, with background, objectives, workplan with outputs and timetable, and budgets will have to be provided by the NCG to the ECPGR Secretariat by 15 June 2008, in order to prepare the submission to the Eleventh SC meeting, which is planned for September 2008. Detailed instructions will be circulated to the NCG.

Recent developments in the PGR international context were then briefly mentioned, including:

- the recent approval in 2006 of the Standard Material Transfer Agreement by the Governing Body of the International Treaty;
- the opportunities for funding project proposals through the 7th Framework Programme;
- the ongoing construction by the government of Norway of the Arctic Seed Vault as a safety-duplication *ex situ* repository; and
- the recent initiative by the Global Crop Diversity Trust, following a multi-million dollar donation by the Gates Foundation, to open a competitive grants scheme to support the evaluation of genetic resources. The Trust will provide approximately 20-25 grants annually, to enable breeders and others to screen germplasm collections for important characteristics and to make the information generated publicly

available. Crops eligible for this funding are a preferential group of 22 Annex I crops¹, specifically: banana, barley, bean, breadfruit, cassava, chickpea, coconut, cowpea, faba bean, finger millet, *Lathyrus* sp., maize, major aroids, lentil, pearl millet, pigeon pea, potato, rice, sorghum, sweet potato, wheat and yam.

Petter Marum asked whether the exclusion of forages from the list was meant to imply a perceived lower value for these crops. L. Maggioni replied that the forage crops included in Annex I of the Treaty were mainly of interest in the European context, while the Gates Foundation had decided to prioritize their actions on food crops of higher relevance for the developing countries. He specified that the Trust would consider any Annex I crop proposal, but only if they did not receive a sufficient number of high-quality proposals for the selected high priority crops.

An Ghesquiere announced that Bulgaria, Belgium and France will submit a proposal for the evaluation of *Lolium* and that the deadline for submission of proposals for the 2008 award scheme was 30 October 2007.

Report of the Working Group's Chair

Presented by Beat Boller

Reports and meetings

Three meetings were held during the period covered by this report (2003 to 2007):

- Eighth Meeting of a Working Group on Forages, 10-12 April 2003, Linz, Austria
Report available, print and online version
http://www.biodiversityinternational.org/publications/pubfile.asp?ID_pub=1017
- Network Coordinating Group on Forages. *Ad hoc* Meeting, 21-22 April 2005, Lindau, Switzerland
Report available, online version
http://www.ecpgr.cgiar.org/Networks/Forages/Forages_Lindau_April2005.pdf
- ECPGR All Network Coordinating Groups Meeting, 29-31 March 2006, Bonn, Germany
Report available, online version
http://www.ecpgr.cgiar.org/Networks/NCG_March06/NCG_Bonn_March06.pdf

Main outcomes from meetings

- **Eighth Meeting of a Working Group on Forages, 10-12 April 2003, Linz, Austria**

Twenty-eight Working Group members and five observers from a total of 28 countries attended the meeting.

The group used the major part of the discussion period to outline and adopt a clearly defined procedure to identify Most Original Samples (MOS). This discussion resulted in an ambitious workplan which aimed at identifying the primary holders of accessions in the Central Crop Databases (CCDBs) with the help of Working Group members to facilitate data flow between genebank curators and CCDB managers.

¹ "Annex I crops" refers to those crops listed in Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture.

Further discussions included an update of safety-duplication facilities, a request for data about regeneration standards used in different countries, and the interest in building a *Medicago* core collection.

A total of 44 presentations were given, all of which are included in the report of the meeting. They covered topics concerning:

- European Central Forage Databases (3)
 - National collections and collecting activities (23)
 - International cooperation for collecting missions (4)
 - Core collections (3)
 - On-farm conservation (3)
 - Research activities (8)
- **Network Coordinating Group on Forages. Ad hoc Meeting, 21-22 April 2005, Lindau, Switzerland**

This meeting was initiated to stimulate a more active exchange of information between genebank curators, WG members and CCDB managers because the Network Coordinating Group (NCG) felt that progress on the workplan was too slow. Six NCG members (Beat Boller, Petter Marum, Evelin Willner, Loek van Soest, Lajos Horváth and Magdalena Ševčíková) attended in person. Valeria Negri was represented by Luigi Russi. Chris Kik attended as an observer and was co-opted as a new NCG member, replacing Loek van Soest.

Four CCDB managers who are not members of the NCG also participated by invitation. This resulted in ten databases of the seven priority genera being represented by their managers or persons closely collaborating with the CCDB managers:

- *Trifolium pratense* (Lajos Horváth)
- *Trifolium repens* (Ian Thomas)
- *Trifolium subterraneum* (Mónica Murillo)
- *Medicago sativa* (Jean-Paul Sampoux)
- Annual *Medicago* (Mónica Murillo)
- *Lolium* (Ian Thomas)
- *Phleum* (Petter Marum)
- *Festuca* (Gregorz Żurek)
- *Dactylis* (Gregorz Żurek)
- *Poa* (Evelin Willner)

The Group encouraged data flow directly from genebank curators to CCDB managers, without waiting for data to become available through the European Internet Search Catalogue (EURISCO). To enable this, the forage descriptors defined at previous meetings were revised so as to comply with EURISCO descriptors. A number of descriptors were considered redundant but 12 specific forage descriptors were maintained. It was agreed that in data exchange between genebank curators, WG members and CCDB managers, a common format should be used, adding these 12 specific forage descriptors after the EURISCO descriptors. A sample Excel sheet was prepared for distribution. Exchange of data was practised in a technical session including real data, which stimulated actual progress in updating CCDBs with original data. The workplan regarding primary holder definition was revised and new milestones were set.

Possibilities for submitting a proposal to the call for projects under EC870/2004 were discussed. The original idea of submitting a *Lolium* project, building on the experience of the *Lolium* core collection trial of 1995-1997 was abandoned, and it was agreed to build a consortium to submit a *Medicago* project under the leadership of Vladimir Meglič. An outline was generated for this project and interest in participating was expressed by Luigi Russi,

Jean-Paul Sampaou and Mónica Murillo. It was suggested that it might be possible to include the final evaluation of the *Lolium* core collection trial as one workpackage.

A further update of safety-duplication facilities was obtained and the data concerning regeneration standards followed in the different countries were compiled. These tables are included in the report of the meeting.

- **ECPGR All Network Coordinating Groups Meeting, 29-31 March 2006, Bonn, Germany**

This meeting, which was the first one held in this format, was attended by the complete Forages NCG. Beside a number of presentations of various items of interest to all networks, one day was devoted to Network-specific issues. The Forages NCG reviewed progress of the workplan and sought for a solution to enable the submission of the *Medicago* project for EC870/2004. Jan Nedelnik was appointed coordinator. Furthermore, suggestions for Phase VIII (2009-2013) were collected.

Workplan

- **Define primary holder of the accessions**

Seven genera were given highest priority for completion of the definition of primary holder of the accessions: *Dactylis*, *Festuca*, *Lolium*, *Medicago*, *Phleum*, *Poa* and *Trifolium*. The final aim was to assign values to the descriptor "European Forage Collection" (EFC). Accessions given a value "Yes" to this descriptor would be considered candidates for inclusion in AEGIS, the European Genebank Integrated System proposed by ECPGR. The workplan included the steps listed in the following table:

Step	Action	Responsible	Interaction with
1	Add MOS data to accession data in genebank (ORIGINALITY descriptor)	Genebank curators	
2	Per genus, deliver national datasets containing MOS info to CCDBs	WG member	Genebank curators, CCDB managers
3	Incorporate MOS info in CCDBs and assign preliminary value for primary holder (PRIMCOLL)	CCDB manager	
4	Identify cases needing clarification (multiple samples sharing highest level of ORIGINALITY); propose solution	CCDB manager	Genebank curators and WG members
5	Obtain approval of assumption of responsibility as primary holder for list of predefined accessions	CCDB manager	Genebank curators and WG members
6	Assign values (Yes/No) to EFC descriptor field where situation is clear	CCDB manager	

Progress in this ambitious workplan has not been as fast as it was hoped after the 2003 WG meeting. Steps 2 and 3 have only partly been completed, and substantial progress in steps 4 and 5 was limited to the *Poa* and *Phleum* databases, as will be shown later during the meeting. The main reason for the limited extent of data flow between genebank curators, WG members and CCDB managers was probably that genebank curators had focused their efforts on delivering data to their National Focal Points for EURISCO. However, when CCDB managers download data from EURISCO, the specific forage descriptors including

ORIGINALITY, PRIMCOLL and EFC get lost because they are not included in the EURISCO descriptors.

- **Submit proposal to EC870/2004**

The search for a coordinator started at the Eighth Meeting of the WG in Linz, Austria, in April 2003. An informal meeting of interested parties was held at the EUCARPIA Meeting, Brno, Czech Republic, September 2003 and it was suggested that the Group might choose *Lolium* for a project, building on the experience of the previous efforts of the Group, which had resulted in a multi-site evaluation of *Lolium perenne* accessions between 1995 and 1997. However, lack of interest in coordinating such a project resulted in support for the alternative proposal for a *Medicago* project, as agreed at the NCG *ad hoc* Meeting in Lindau, Switzerland, in April 2005, with Vladimir Meglič suggested as coordinator. Unfortunately, due to insufficient capacities it was not found possible to respond to the first call of 2005 and Jan Nedelnik of the Research Institute for Fodder Crops (RIFC), Troubsko, Czech Republic, was appointed coordinator after the NCG meeting in Bonn 2006.

A proposal with the acronym GENMEDIC was prepared by Jan Nedelnik in close collaboration with Vladimir Meglič and they succeeded in submitting it to the second call in June 2006. Ten partners from 8 countries were involved, and their participation had mostly been facilitated by Working Group members. In the rating of 42 projects submitted to that call, the GENMEDIC proposal was one of 18 projects which passed the threshold level for funding, but unfortunately it was put in a “reserve list” of 7 projects which could not be funded within the budget, while only 11 projects were actually chosen for funding.

In the discussion on this point of the report, Petter Marum proposed that the project could be submitted for funding to the Trust, on the grounds that it contains several components on the evaluation of an Annex I crop. It was suggested that the criteria of eligibility for the Trust awards should be checked to see whether these could be matched with the purposes of at least some components of the *Medicago* project. However, a reminder was also given that the Trust is giving priority to funding a list of 22 crops which does not include forage crops.

Aims and schedule of the meeting

Beat Boller listed the aims of the current meeting as follows:

- Update on status of national collections and Central Crop Databases;
- Review progress on the workplan concerning sharing of responsibilities (primary holder definition) and decide on an efficient way to complete this action;
- Decide on modifications for preferred and acceptable standards for regeneration;
- Draft workplan for Phase VIII of ECPGR.

European Central Forage Databases

Role of European Central Forage Databases in relation to EURISCO

L. Maggioni informed the group that the EURISCO catalogue (<http://eurisco.ecpgr.org>) had recently expanded to reach over one million accession data from 35 National Inventories. Download functions (by national inventory and by genus) were introduced as of March 2006 and EURISCO had become a data provider for the Global Biodiversity Information Facility in 2006. Revisions of database functionalities and the Web site interface were in progress and should be concluded soon.

Considering the lack of success of the project proposal EPGRIS2 submitted for funding to the Regulation EC 870/2004, the ECPGR Documentation and Information Network had

decided to launch a self-funded voluntary action, based upon the belief that doing things collaboratively can result in better results than working alone. This initiative is called EPGRIS3 (www.epgris3.eu), and has the objective of providing a platform for collaboration in the field of documentation and information on PGR in Europe. Offers of collaboration are welcome whenever the proposed activities add value to PGR documentation and information systems in Europe. The project has a list of activities related to: Vision and scope discussion; Data quality and quantity – EURISCO; Uploading mechanism; User interfaces; Network of National Focal Points. These activities will be carried out by leaders and collaborators with agreed workplans and timeframes. The link between the European Central Crop Databases (ECCDBs) and EURISCO is considered a burning issue in the European PGR documentation arena and an activity is needed to explore this link and create mechanisms that will encourage adding value on both sides. A meeting to address this very point is tentatively scheduled for February 2008 in Bonn, Germany and the Network is invited to indicate participants that they would like to see involved.

Other planned EPGRIS3 activities of great relevance for the Forages Network relate to the handling of characterization and evaluation data, the revision of the Multi-Crop Passport Descriptors (MCPDs), the establishment of *in situ* inventories and the creation of crop portals.

Discussion

P. Marum commented that meetings discussing database development and their relationship with EURISCO should also consider involvement of the database users, not only the managers. He expressed an interest in representing this category in the forthcoming meeting in Bonn.

Major advances in development of individual forage crop databases

Timothy database

P. Marum described progress on the analysis of the ECPGR *Phleum* database. He had found some difficulties in downloading data from EURISCO, since special software was needed to open the related files and this was not made clear on the EURISCO Web site.²

The *Phleum* DB currently contains 5435 accessions, while EURISCO has 5007. For some countries there are more data in EURISCO than in the ECPGR Database, in other cases it is the opposite. A large number of accessions are present in Poland (> 2000) and he wondered whether it is really possible to maintain all of them. For all countries, accessions with “own country” origin are less than the total. An attempt was made to identify (and suggest) primary collection holders. This exercise is easy for the majority of the accessions, while it remains difficult in a number of cases. He finally noted that unfortunately the forage-specific characterization descriptors are left empty in most cases.

Agropyron database

Y. Guteva gave an account of the ECPGR *Agropyron* database, which she is managing together with Siyka Stoyanova at the Institute for Plant Genetic Resources (IPGR), Sadovo, Bulgaria. The database, which is structured according to the MCPDs, contains records of 354 accessions from 15 institutes in 12 countries. The dataset was downloaded from EURISCO,

² It was subsequently clarified with the EURISCO Coordinator that simple “unzipping” software is all that is needed to download and open EURISCO files. A link to an unzip free download software for PC and MAC was made available from the EURISCO site.

since no replies were directly received from the collection holders. Accessions included in the database belong to 22 species, the most frequent being *Agropyron cristatum* (L.) Gaertn. with 154 accessions, followed by *A. pectiniforme* Roem. et Schult. (31) and *A. desertorum* (Fisch. ex Link) Schult. (26). Thirty-four accessions are only known by their genus and 25 accessions are recorded as "sp." Information about the country of origin is available for 338 accessions and it is not known for only 16 accessions. The accessions in the database are reported to originate from 18 countries, with 73 accessions from Mongolia, followed by 40 from Kazakhstan, 31 from Russia and 28 from Bulgaria.

Y. Guteva replied to a question about the importance of *Agropyron* as a forage crop, by explaining that it is a long-lived perennial genus, which is valuable for its drought resistance and high yield in dry areas.

L. Horváth also commented that *Agropyron elongatum* is a species obtained from Mongolia 30 years ago which has shown high yield and good adaptation in Hungary. An *A. elongatum* variety with high yield is used as an "energy plant" in Hungary.

Bromus database; Minor forage legumes database; Trifolium pratense database

L. Horváth provided the following information on the three central databases managed by the Research Centre for Agrobotany (RCA), Tápiószéle, Hungary:

- the *Bromus* database contains 672 accessions and 172 have been identified as MOS.
- the Minor forage legumes database contains 2022 accessions from 160 species and 112 have been identified as MOS.
- the *Trifolium pratense* database contains 3346 accessions and 1229 have been identified as MOS.

Both the *Bromus* and the *T. pratense* databases are very old and need to be completely updated. In many cases, the current holders of the accessions recorded in the databases are not known.

Trifolium subterraneum database; annual Medicago database

Mónica Murillo Vilanova and Francisco González López sent the following information:

The European *Trifolium subterraneum* database contains a total of 4876 accessions held by 14 different Institutes, while the Annual *Medicago* database includes 3043 accessions from 8 holding Institutes. EURISCO passport descriptors have been applied to the updated databases. In the updated *T. subterraneum* database, 53% of the accessions, mainly collected in Spain and Portugal, are held at the Servicio de Investigación y Desarrollo Tecnológico (SIDT) genebank, while in the *Medicago* database only 23% of the accessions are held at the SIDT. Both collections held at the SIDT Genebank (*Trifolium subterraneum* and annual *Medicago*) have been multiplied and safety-duplicates have been sent to the Centro de Recursos Fitogenéticos (CRF) in Madrid. New accessions were collected during the last three collecting expeditions: 2002 (South Spain and Portugal), 2003 (Córdoba and Ciudad Real, Spain) and 2006 (Cáceres, Spain).

Regarding the identification of the MOS, help was received only from Bulgaria. Australia has also contributed to the MOS search. Although attempts were made on several occasions to obtain data, no real development has been achieved. An urgent request to the WG members to provide data for the *Trifolium subterraneum* and Annual *Medicago* databases is reiterated, in order to enable updating of the Databases and to complete the identification of MOS.

Reports on status of National Collections and collecting activities

National reports were presented by Albania, Austria, Azerbaijan (poster), Belgium, Bulgaria, Croatia, Czech Republic, Estonia, France, Germany, Hungary, Ireland, Italy, Lithuania, Macedonia (FYR), the Nordic countries, Poland, Serbia, Slovakia, Slovenia, Switzerland, Turkey and the UK. A report was received from Spain; Cyprus and Romania will provide information later.

Full texts of the above presentations will be included in Part II of this report.

Of all the valuable information that was communicated by the WG members, the following points led to discussion or were specially noted by the Group:

Samples of different grass species that were collected in Ireland by a German/Irish mission were deposited at the University College, Dublin, but they are no longer available from there. However, the samples conserved in Germany as duplicates have recently been multiplied and the German genebank will provide these accessions to Ireland.

Luigi Russi informed the group that the University of Perugia, Italy had recently received from Australia the entire core collection of *Medicago truncatula*, with the purpose of characterizing it for percentage of hardseededness. Data will be openly shared.

Petter Marum stated that the entire base collection of the Nordic countries had recently been transferred to Denmark, while the active collection remained in Alnarp, Sweden, and safety-duplicates are stored in the Svalbard islands

The Polish collection has recently been increased by an addition of 1000 accessions and constitutes a large part of the European collection of forages.

Variation of *T. repens* throughout the UK was molecularly characterized, with little variation detected, except for the populations found in the little island of St. Kilda, west of the Hebrides, which was left deserted 77 years ago. A relic agricultural situation has remained unaltered since then. Sheep left without human control maintain the grazing pressure and the populations of *T. repens* have survived and show significant differences compared to those in the rest of the country. In the near future, further surveys will be carried out in other remote islands, such as the Orkneys, etc.

The collection at the Institute of Grassland and Environmental Research (IGER), Aberystwyth, UK has received over 6000 new legume accessions, mainly breeding lines, from the breeding departments, and these will have to be analyzed for possible incorporation into the permanent collection. These new responsibilities with which the reduced staff at IGER are charged, are limiting their efficiency in the development and analysis of the European databases of *Lolium* and *T. repens*.

International cooperation

Reports on larger scale collecting activities, including partners of different countries

Joint Bulgaria-Japan and Bulgaria-Switzerland activities

Y. Guteva described recent activities involving international cooperation for the improvement of genetic diversity of forage crops. A collecting mission supported by Japan and involving the Gene Bank of Bulgaria (IPGR, Sadovo), the Institute of Mountain Stockbreeding and Agriculture, Trojan, Bulgaria and the Gene Bank of Japan (National Institute of Agrobiological Sciences, NIAS), was carried out in July-August 2006 in Bulgaria. Five floristic regions were visited: Central Balkan, Strandza, Rila, Pirin and Rhodope Mountains. A total of 123 accessions of forage plants were collected from 51 localities. The

objective of the mission was focused on ecotypes and landraces of *Trifolium pratense* and *T. repens* which were found in meadows, pasture areas and open areas within the forests. Characterization will be carried out in 2008-09.

A second joint collecting mission (Bulgaria and Switzerland) was carried out for characterization and evaluation of natural populations of *Festuca pratensis* and *F. arundinacea* in their habitats in Bulgaria. This project (2005-2008) is financially supported by the SCOPES cooperation programme (Scientific Cooperation between Eastern Europe and Switzerland), Switzerland. Considering that very few *Festuca* accessions of Bulgarian origin are conserved in Sadovo, the objectives of the project are to enlarge the genetic basis of the collection with new germplasm from distinct ecological niches in the Rhodope Mountains and Balkan Mountains and to correlate variation in important plant characteristics with site-related factors like management, type of vegetation, altitude etc. In total, 28 populations of *Festuca pratensis* (21), *F. arundinacea* (4) and *F. rubra* (3) from 26 sites were collected. Agronomic characterization will be carried out both in Bulgaria and in Switzerland. Genetic characterization (microsatellites, simple sequence repeat (SSR)) will be done in Switzerland. Seed storage protein patterns will be determined at IPGR-Sadovo.

Joint Slovenia-Slovakia and Slovenia-Macedonia (FYR) collecting missions

Vladimir Meglič explained that the Forages WG of the South-East European Development Network on plant genetic resources (SEEDNet) organized expeditions in Macedonia (FYR), focusing on several crops. In the case of forages, 94 fodder crops and meadow plants were collected in the Probistip region. *Festuca pratensis* and *Trifolium pratense* were particularly targeted.

Another collecting mission was organized in 2006 and 2007 in collaboration between Slovenia and Slovakia, collecting 37 accessions of fodder plants, grasses and meadow plants. René Hauptvogel explained the geographic information system (GIS) technology adopted during this mission and showed the maps obtained showing the collecting sites and their elevations.

Joint German-Czech collecting mission

E. Willner explained that collecting activities are carried out only in well-founded cases, since the number of accessions in collections is already high. This was the case for a mission to collect *Poa supina* which was identified, through analysis of the *Poa* database, as being poorly represented in European collections, with only seven unique accessions..

Poa supina has a potential use for turf breeding and is useful for genomics research or interspecific hybridization like other under-represented species (*P. annua*, *P. angustifolia* and *P. alpina*). A joint collecting mission between Germany, the Czech Republic and the USA was therefore organized, with the participation of Dr R.C. Johnson (USDA-ARS, Department of Crop and Soil Sciences, Washington State University), Ms Magdalena Ševčíková (Curator of National Czech Collections of Grasses, OSEVA PRO Ltd., Zubří, Czech Republic), Ms Evelin Willner (Curator of Oil and Fodder Crops, Genebank of the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Malchow/Poel, Germany) and Dr David Huff (Associate Professor of Turfgrass Genetics, Department of Agronomy, Pennsylvania State University). The South Moravian area and the Bohemian Forest (Czech Republic) were explored and 52 seed samples from 25 sites were collected. In Germany (Bavarian Forest, North Alps), 97 sites were visited and 192 seed and 116 clonal samples were collected.

Species of primary interest included *Poa pratensis*, *P. pratensis* subsp. *angustifolia* and *P. supina*. Species of secondary interest included *P. alpina*, *P. annua*, *P. nemoralis* and *P. palustris*.

Multiplication and characterization will be carried out and data recorded in the EPDB.

Dr Huff will study the differentiation of several *Poa* species by analyzing their genetic background (ploidy level, relationship between *annua annua*, *annua mutabilis*, *supina* and new *Poa* species).

It was also pointed out that other international joint missions were presented as part of the national reports (i.e. the Nordic mission to Greenland).

Sharing of responsibilities

Progress of WG Workplan to define and verify “Originality” status, leading to the systematic definition of “Primary Holder” and eventual assignment of “European Forage Collection” status

Progress in the *Poa* database

On the basis of an updated European *Poa* Database (EPDB), data were analyzed to define and verify the “Originality” status, which will lead to the definition of the “Primary Holder”.

The EPDB includes more than 5000 accessions, belonging to 37 species originating from 52 countries. Accession donors are 22 institutions from 17 countries.

A first data investigation (screening for duplicates among accessions by variety names) showed that there are 522 duplicate accessions (with multiple occurrences of 186 accession names). The definition of most original sample (MOS) for each accession name and verification of primary holders can lead to a reduction of unnecessary multiplication (by 336 accessions).

As a result of the first MOS definition, there are 3443 accessions that are “most original samples”, 68% of the whole collection. These accessions mostly belong to the group of collected material (70%). For the remaining approximately 1500 accessions, there will be discussions at the European level with several Working Group members and curators as to whether and which accessions should be maintained by whom in the future.

In all clear cases, from the “Originality” status, the “Primary Holder” could be estimated by the database manager for 70% of all the accessions of the EPDB. Eighteen percent of the collection was already accepted by the respective curators as “Primary Holder” and these accessions are candidates for the EFC. This is the first step in the direction of assigning the “EFC” status descriptor, which is completely accomplished only when the Primary Holder institution maintains and regenerates all these accessions in accordance with European genebank standards and when there is a safety-duplicate for each accession. A data comparison shows that this already seems to be true for 13% of all accessions (total 656 from SWE002 (NGB), LTU001, NLD037, ITA363, CHE002, partly DEU271).

Discussion

The Group discussed the need to make more progress in order to validate MOS and to identify primary holders.

It was established that data on breeder lines that have recently been included in the IGER collection may be entered into the central databases and made available to users, upon request, but no automatic responsibility for maintenance will be accepted by IGER, even if the accessions are MOS (i.e. they will not have a primary holder status assigned).

E. Willner explained that the number currently suggested as “primary holder” for Germany also includes material which originated outside Germany, since the German curator is the collector and feels responsible for it. This material can however be considered for transfer of responsibility to the country of origin, upon consultation with the relevant curators.

As a first round, Steps 1, 2 and 3 of the workplan have been completed for *Poa* and *Phleum*. However, this is an ongoing process as long as new accession data are being delivered to the DB.

Curators should make sure that data are provided both to the DB managers and to EURISCO.

I. Thomas said that in the case of the *Lolium* and *Trifolium repens* databases, incorporation of a new large UK collection needs to be completed before the analysis of these databases for MOS can be started.

It was noted that DB managers will need to frequently remind the WG members to provide the data in order to be successful.

L. Horváth would like to see DB managers obtaining information more actively, not only from WG members, but also from curators and national coordinators. However, B. Boller made it clear that the WG members have the obligation to know what is going on in their own country and he encouraged each WG member to take on their share of this responsibility.

L. Horváth said that the *Bromus* and *T. pratense* DB need to be completely renewed and that only after that, can the primary holder identification be started. Although it is not clear yet when this will be possible, the RCA Tápiószele wish to continue the maintenance of the databases and will strive to make progress as soon as possible.

The Group encouraged Lajos to start the new databases by extracting the data from EURISCO.

J.-P. Sampoux explained that a new person responsible for the *Medicago sativa* database will soon be appointed at the Institut National de la Recherche Agronomique (INRA) and that this person will take over the responsibility for making progress with this DB.

For the *Festuca* and *Dactylis* databases, E. Willner stated that G. Žurek, the DB manager, is asking for data and that work on the DBs is in progress.

Decisions and workplan

- Poa collection

Proposed Primary Holders for Poa accessions suggested by E. Willner were checked with the Group and commitments were accepted by the delegates as follows:

Country	Institute code	Commitments
Belgium	BEL004	2 accs., A. Ghesquiere accepts 2 as PRIMCOLL
Bulgaria	BGR001	69 accs. are MOS and 1 acc. is "more away" donation, E. Willner will send data to Y. Guteva (final decision to be confirmed)
Czech Republic	CZE082	71 accs., E. Willner will send data to M. Ševčíková (to be confirmed as PRIMCOLL)
France	FRA-GEVES	17 accs., J.-P. Sampoux accepts 17 as PRIMCOLL
Hungary	HUN003	127 accs. (to be discussed, needs a formal agreement from responsible authority)
Poland	POL022	2398 accs. (to be discussed with G. Žurek)
Romania	ROM003	7 accs., E. Willner will send data to T. Marusca (final decision to be confirmed)
Slovakia	SVK001	1 acc., E. Willner will send data to J. Drobná (final decision to be confirmed)
Slovenia	SVN019	22 accessions are MOS, V. Meglič accepts 22 as PRIMCOLL
Turkey	TUR001	13 accs., H. Ozpinar accepts 13 as PRIMCOLL
United Kingdom	GBR016	44 accs. are MOS and 7 accs. are "one away" donations, I. Thomas accepts for IGER (others to be checked with GBR088)

The detailed table with the full list of accessions for which primary holders have been identified will be included in this report as Appendix I. The accepted accessions will be marked by the database manager in the Poa database in the corresponding descriptor (PRIMCOLL).

As a next step, each WG member will receive from the DB manager the list of accessions that need clarification as regards to:

1. their MOS status
2. acceptance of Primary Holder
3. complete data for storage (long-term and safety-duplicate)
4. acceptance as candidates of EFC
5. empty fields to be completed

A reminder was given that the detailed responsibilities for the primary holder were defined in the workplan agreed at the Lindau meeting and a revised version is attached as Appendix II.

- Phleum collection

Petter Marum showed the data on the Phleum DB, giving his suggestions of the primary collection holders (Step 3 of the workplan). He will continue the interaction with the respective WG members, in close collaboration with the Nordic Gene Bank (NGB), in order to finalize the decision on primary holders (steps 4-6 of the workplan), as above for Poa (1 to 5).

- All collections

All DB managers are encouraged to submit the list of proposed primary holders to the respective WG members or to the genebank curators, with a copy to the WG member.

WG members are responsible for ensuring that curators within their country provide their data to their respective National Inventories, hence to EURISCO, as well as specific forage descriptors data to the Central Crop DB managers. WG members should also inform the DB managers about acceptance by curators in their country of primary holder responsibility for a number of MOS accessions.

All the WG members are encouraged to interact with the various DB managers and the curators in their respective countries in order to facilitate the conclusion of the workplan steps leading to assignment of accessions to the European Forage Collection.

A table with contact details of database managers for Dactylis, Festuca, Lolium, Medicago, Phleum, Poa and Trifolium was prepared and will be added as Appendix III.

The Excel format provided as a background document in preparation for this meeting should be used for data exchange. The file is also available from the Chair or the Secretariat upon request.

Timeframe

- The Poa and Phleum exercise is expected to be completed by the end of the year 2007.
- WG members are expected to provide updated data to the DB managers by the end of November, every year.

AEGIS

A short account prepared by L. Maggioni and J. Engels (AEGIS Coordinator) was given of the ECPGR-funded project for "A European Genebank Integrated System" (AEGIS), which carried out a feasibility study (2004-2006) to promote the creation of a rational European plant genetic resources genebank system. This is aimed at conserving safely and in the long term the genetically unique and important accessions for Europe, at the same time ensuring their genetic integrity, viability and availability for breeding, research, and education. Principal benefits of AEGIS would be the following:

- Improved collaboration among European countries
- Cost-efficient conservation activities

- Reduced redundancy in European collections
- Improved quality standards of the conserved material across Europe
- Improved data quality and quantity for the European collections
- More effective regeneration
- Improved security of germplasm through safety-duplication
- Improved characterization and evaluation
- Facilitated access to germplasm
- Improved linkages between genebanks and users.

During the feasibility study, four model crop groups (*Allium*, *Avena*, *Brassica* and *Prunus*) were used to take into consideration the organizational, technical, legal, political and financial aspects involved in the development of such a system.

AEGIS will need to establish formal arrangements (a collective Memorandum of Understanding to be signed by the member countries and their institutions, as well as inter-institutional contracts).

The intention is to build on the ECPGR institutional framework, whereby the ECPGR SC provides “governance” and the AEGIS Advisory Committee provides oversight. It will also build on the existing capacity of (national) genebanks and an important role and responsibility will remain with the Crop WGs. National Coordinators will have a coordinating role for AEGIS-related aspects within their respective countries.

Key principles for the establishment of the European Collection are the following:

- A virtual genebank (a genebank without walls)
- Availability of accessions and information to *bona fide* users
- Central coordination (crop-wise)
- Technical guidelines to be established for each crop gene pool
- Decentralized management.

With AEGIS, the intention is, within Europe, to *de facto* extend the Multi-Lateral System, as defined by the International Treaty (IT), to both Annex I and non-Annex I crops of the IT.

A draft collective Memorandum of Understanding (MoU), to be signed by AEGIS member countries and their institutions, is being revised by the SC. The MoU will be a formal document, whereby members agree on the process of registering European Accessions (EAs), committing to conservation and facilitated access for these accessions and adhering to the AEGIS technical standards and monitoring system – as defined by the Working Groups. Countries will also agree to provide specific services to AEGIS, such as responsibilities as lead institutions, database management, equipment and facilities, regeneration capacity, expertise, etc.

Since January 2006, J. Engels, appointed as AEGIS Coordinator as part of the ECPGR Secretariat, has been working on the implementation of the AEGIS initiative. Broad agreement to establish a European Collection has been reached at the Steering Committee level and a “Strategic Framework Discussion Paper” describing the agreed principles will soon be published by ECPGR.³ A process to identify European Accessions is ongoing for the model crop groups, as well as the establishment of technical conservation guidelines. The next steps will be the definition of a Genebank Quality System and of inter-institutional agreements, as well as the assessment of costs of conservation (in a few model cases).

³ Now available online (http://www.ecpgr.cgiar.org/AEGIS/Docs/AEGIS_DiscussionPaper.pdf). Hard copy available upon request.

Suggested actions for the Forages WG are the following:

- Develop proposed initial list of European Accessions (EAs), based on criteria for the selection of Most Appropriate Accessions (MAAs);
- Develop crop conservation guidelines and agreement on the process to meet them;
- Suggest elements for a quality management system (how to monitor, sanction, certify);
- Agree on organizational structures of the Working Groups vis-à-vis AEGIS, i.e. assign roles and responsibilities with Terms of Reference
- Draft “Conservation and Management Plans” based on costs and other considerations.

More information on AEGIS, including the reports prepared by the model crop groups at the end of the feasibility study, is available from www.ecpgr.cgiar.org/AEGIS/AEGIS.htm.

Reconsidering minimum standards for regeneration

Summary of findings in project ICONFORS: published results and conclusions

Maurice Hinton-Jones presented the results from the experiments that were IGER’s responsibility as part of the EU-funded Fifth Framework project on “Improving germplasm conservation methods for perennial European forage species” (ICONFORS).

Conclusions were that a Europe-wide plan for regeneration is not feasible since even populations grown in their country of origin were differentially sensitive to environment; regeneration methods should be considered on a species-by-species basis; and it is more important to consider “how” a population is regenerated rather than “where” it is regenerated.

One experiment was about the effects of site-specific managements on seed yields of *Lolium perenne*. The results indicated that field regeneration gave more seed than seed produced in isolation chambers. However, this could be regarded as excessive rather than sufficient and could impact on seed storage costs. More seed was produced if the plants were established in the spring rather than in the autumn and plants in larger pots produced more seed than those in smaller pots.

Genebanks need to adopt management systems that will improve the growth and development of the plants in the vegetative stage so as to promote the formation of autumn produced tillers that will continue into the reproductive phase to yield sufficient amounts of seed and improve the contribution from genotypes to overall seed yield.

Results have shown that even minor adjustments to current management systems, e.g. earlier sowing and increasing pot size, can significantly improve plant survival and seed yield.

Regeneration in the field was more cost-effective than regeneration in isolation chambers, assuming that the regeneration fields are close to the genebank or institute.

An experiment was undertaken to quantify the extent of cross-pollination between field regeneration plots of white clover. Eight receptor plots were established in an octagonal design, 30 m from the central donor plot. The overall contamination from the donor plots was less than 4%. The overall contamination from feral populations was slightly higher, but still less than 5%. Overall contamination levels can be reduced by choosing areas where the species being regenerated is not threatened by pollen from plants of the same species. Pollen from the donor plots was not restricted to the outer rows of the receptor plot as indicated by earlier studies. The amount of cross-pollination between field regeneration plots in *Festuca pratensis*, with the same isolation distance and barrier crop, was much lower.

The results from the experiment to estimate the heritability of seed yield is in the process of being analyzed. The preliminary results suggest that the heritability is low. This may indicate that a population may not change significantly, due to selection for differential seed production, during one cycle of seed regeneration. It may be more important to bulk harvest the seed of many plants than to construct a balanced seed bulk from few plants.

The results from the experiment to determine the distribution of paternity in terms of the spatio-temporal proximity of male-female pairs have been published in 2006 by van Treuren *et al.*⁴ Their results indicate that a single plant receives most of its pollen from plants in close proximity within the seed plot.

Conclusions are that:

- A Europe-wide plan for regeneration is not feasible
- Adopting a protocol based on “how” a population is regenerated rather than “where” seems the way forward
- Need a correct choice of site
- Need to use suitable management procedures to maximize plant development
- Best systems are the most expensive in the short term, but most cost-effective in the long term as they will reduce the number of regeneration cycles
- Need greater understanding of the physiology of inflorescence production
- Maybe the best way is to do more bulk-harvesting and increase plant numbers
- May consider taking a set of inflorescences from each genotype and having a more balanced yield in this way.

Discussion

B. Boelt commented that the results were based on just one year’s data and it is their experience that yearly climatic variations may have a large impact on flowering characteristics and seed yield results.

L. Russi asked whether the viability of the seeds that did not germinate was checked. M. Hilton-Jones replied that they were not checked.

P. Marum tried to estimate the costs in Norway and found that the costs of regeneration in the field were much cheaper than in isolation greenhouses.

J.P. Sampoux said that in France there are specific areas for production of lucerne seed that are preferred by the breeders.

M. Hinton-Jones did not foresee any problem in regenerating accessions in any of the climatic zones of Europe and suggested focusing more on optimizing vegetative development to maximize reproductive potential.

P. Marum explained the ICONFORS experiment on genetic contamination by windborne pollen as an effect of isolation distance. The objectives were to estimate pollen contamination between small regeneration plots with different isolation distances and barrier crops and to suggest acceptable isolation distances in the field. The field trials were conducted in the Czech Republic, Denmark, Norway and UK. Isolation distances tested were 15 m, 30 m, and 60 m. *Festuca pratensis* was used as a model crop. The different locations used barrier crops of different heights.

Conclusions were the following: rye appears to be the best barrier crop to reduce contamination from neighbouring plots. At all locations the level of contamination decreased with increasing isolation distance. With a large isolation distance, zero contamination can almost be achieved. In cases where there are many populations of the same species to be

⁴ Treuren, R. van, P.J. Goossens and M. Ševčíková, 2006. Variation in effective pollination rates in relation to the spatial and temporal distribution of pollen release in rejuvenated perennial ryegrass. *Euphytica* 147(3):367-382.

rejuvenated and the seed plots are organized in a row and column pattern, isolation distances of at least 30 m are needed with a tall barrier crop to reduce contamination level below 1%. Contamination can be reduced by alternating different species in the field design.

Recommendations on modification of preferred and acceptable standards for regeneration

Discussion

B. Boller asked whether, based on the results presented, we could be more relaxed on the choice of the regeneration site?

P. Marum commented that we need to ensure that regeneration is carried out in a fairly similar climate to that of the place of origin (e.g. one would not go to Portugal with Norwegian material). If the climate is too different from the location of origin, one may expect the population to change due to the effects of environmental selection. Earlier trials in Norway have shown that such selection can be a real problem.

The comment was made that, if you multiply an accession in a climate that is similar to that of the original site, bulk harvest can be tolerated, and one can instead increase the number of plants to reduce drift. A compromise between balanced bulk and bulk harvest was suggested by R. Johnson from the USA. He suggested harvesting a specific number of panicles from each plant. It is the aim of our regeneration protocol to ensure that our accessions, after regeneration, are as similar as possible to the original sample.

P. Marum commented that it is a lot more work to harvest, thresh, and clean the seed of 30 individual plants to be kept separate, compared to harvesting the seed of 100 plants in a bulk.

The question was asked if it was necessary to make sure that all 100 plants contribute to seed yield.

B. Boller suggested that this was not necessary. One can expect that with 100 plants, at least 60 will contribute substantially to the seed yield. It is obvious that the initial collection should also derive from at least 30 individuals – of course this is something that we do not know for sure, since these data are not usually recorded in the databases.

Decisions

Revision of regeneration procedures

The preferred standard for regeneration is a bulk harvest of 100 plants or more. If a lower number of plants is used, it is recommended to harvest a sub-sample of seed separately from each plant and keep it separate for future regeneration (the active collection can be unbalanced bulked).

- For grasses

The preferred isolation distance should be at least 30 m with an efficient barrier crop. The distance of at least 60 m without an efficient barrier crop is acceptable.

- For insect-pollinated crops:

The preferred standard is to use isolation cabinets.

Acceptable standard: Field multiplication with an isolation distance of at least 100 m.

The requirement to maintain a minimum distance between plants is dropped from the list of preferred standards.

A revised description of the regeneration standards used for forage species is included in Appendix IV.

Core collections

The European Lolium core collection

The Group asked what progress had been made in the analysis of the evaluation of the European *Lolium* core collection. Ian Thomas stated that a preliminary statistical analysis was made at HRI Warwick and that these data were provided in a CD to An Ghesquiere. However, A. Ghesquiere thought that these data were not easy to work with and some data seemed to be missing. I. Thomas said that he could try to retrieve the original files including a first analysis made by R. Sackville Hamilton, in collaboration with F. Balfourier, in which the data had been harmonized. These files could be made available to anybody who wished to go further with the analysis or use the data to make selections of samples. I. Thomas also stated that a new statistician had been appointed at IGER, but he could not confirm whether further analysis of the *Lolium* data would be carried out there.

The Group commented that the *Lolium* project had generated a very large amount of data and it would be very much appreciated if a statistician could work on these data and prepare a publication. So far, the only published accounts of the *Lolium* project are a poster presented in 1997 at the International Grassland Congress in Winnipeg, Canada⁵ and a paper by Sackville Hamilton and Marum presented in the 21st EUCARPIA Forages Section meeting, Cartusia/Karthause, Switzerland.

On-farm / *in situ* conservation

Experiences from the Nordic countries

M. Veteläinen explained the special situation of the Nordic countries with regard to landraces. The strong influence of the extreme Nordic climate enabled a number of landraces to retain commercial importance due to their long-term adaptation to the regional conditions. Several landraces have been tested officially for Distinctness, Uniformity and Stability (DUS) and for Value for Cultivation and Use (VCU) and are on national variety catalogues. For example, the timothy landrace 'Grindstad' is one of the most widely used varieties in Norway and Sweden. The highest number of landraces on national lists is found in Finland with seven landraces, followed by Iceland with three. Many more landraces are still used locally in Finland and a national regulation has been set up which permits the maintenance and commercialization of landraces after they have passed testing for VCU and a simplified test for DUS characters. Farmers who maintain such registered landraces receive a subsidy which covers the cost of the testing. Currently, four such landraces, mainly from red clover, are registered officially. It was stressed that it is not yet clear whether the Finnish solution completely conforms to the new, not yet approved EU regulation on "conservation varieties", but nevertheless it is considered acceptable within EU seed trade regulations.

B. Boller wondered how Finland was able to set up such a regulation while Italy, during the same time period, has abolished a previously existing, similar system for lucerne landraces due to stricter EU regulations. M. Veteläinen answered that this was probably a question of different interpretation of the EU rules in different countries. L. Russi said that

⁵ Sackville Hamilton, N.R. et al. 1997. The European Ryegrass core collection: a tool to improve the use of genetic resources. Poster presented at the XVIIIth International Grassland Congress, 9-18 June 1997, Winnipeg, Canada.

the way found to work in Italy was to register varieties derived from landraces officially after a few cycles of selection for homogeneity within the populations.

M. Veteläinen further presented some Nordic nature conservation activities that also involve *in situ* conservation of forage plants. Many of the projects focus on old meadows existing in nature conservation areas like river valleys and sea shores. These areas are managed by nature conservation agencies in a way that should ensure their long-term maintenance. However, these agencies are usually primarily interested in species diversity of plants and animals in these ecosystems rather than in genetic diversity of plants for food and agriculture. Therefore, M. Veteläinen asked for increased interaction between nature conservation agencies and the plant genetic resources/plant breeding community. These projects are still at their very beginning.

Geo-climatic structuring of fine-leaved fescues

J.-P. Sampoux presented an advanced statistical analysis of a study of fine-leaved fescues (*Festuca rubra sensu lato* and *F. ovina*). The study was based on a precise taxonomic classification of a large French collection, as well as on the phenotypic characterization of spaced plants and rows in several field trials. These data were related to climatic data at 1 km resolution, soil texture and land use at collecting sites. Canonical correlation analysis of taxonomic classification revealed taxa to be distributed along gradients of summer radiation and mid-season rainfall and this was interpreted as a gradient of summer water balance. Intra-taxon diversity was assessed in *F. nigrescens* (145 populations) and *F. rubra fallax* (110 populations). Clustering of populations within each taxon based on phenotypic traits, followed by canonical correlation analysis resulted in phenotypic clusters to be separated along a gradient of winter temperature. Together with geostatistical models based on autocorrelation trends, these results can be used to predict inter- and intra-specific distribution of diversity in order to set up a network of *in situ* conservation sites.

Questions were asked about the taxonomy of *F. rubra* subspecies and no immediate consensus was reached. J.-P. Sampoux explained that *F. rubra* taxonomy was under constant revision. Some taxonomic criteria are quantitative and may overlap between subspecies, often making distinction difficult, and ploidy levels are not consistently related to length, presence or absence of rhizomes.

Landscape genetics to secure *in situ* conservation

This new French project, presented by J.-P. Sampoux, will address the impact of habitat fragmentation on sustainability of spontaneous diversity, and the impact of gene flow and selection pressures on spontaneous diversity differentiation. *Lolium perenne* was chosen for this study. An analysis of phenotypic and neutral genetic diversity will be carried out with respect to the relative size of areas available for spontaneous and sown diversity, the level of fragmentation of spontaneous diversity, and the management of grassland areas. Three landscapes of Pyrenean mountain valleys have been chosen, of 400 ha each, and it is planned to sample 2000 plants in each landscape.

Habitats for *in situ* conservation of *Lolium multiflorum* and *Festuca pratensis*

B. Boller presented the outcome of a PhD project carried out by M. Peter-Schmid at Agroscope Reckenholz-Tänikon (ART). Genetic diversity within and between populations collected in permanent grasslands subjected to differing management intensities was compared using molecular marker (SSR) analysis, as well as phenotypic characterization of 60 individual plants per population carried out in a field nursery. The data were analyzed in

relation to environmental site characteristics and to the floristic composition of the grasslands.

The genetic diversity within the populations differed little among the sites, or between collected material and cultivars. Between-population differentiation in terms of molecular marker diversity reflected the geographic origin of the populations for *F. pratensis* but not for *L. multiflorum* where no distinct structuring of the populations was observed. Redundancy analysis identified the environmental factors altitude, longitude, latitude and management as being the ones which significantly affect the structuring of the *F. pratensis* populations.

Factor analysis of phenotypic data confirmed a clear separation of *F. pratensis* cultivars from ecotype populations and a grouping of ecotype populations according to the region of origin. Conversely, no distinct grouping of ecotype populations or cultivars of *L. multiflorum* was observed. Analysis of grassland vegetation revealed collection sites of *F. pratensis* to be more stable in their botanical composition than *L. multiflorum* collection sites. Principal component analysis of vegetation data of collection sites of *F. pratensis* resulted in groups of similar sites which resembled the groups found on the basis of phenological and marker data. It was concluded that no specific habitat type stood out as being especially suited for *in situ* conservation, and there was no direct relationship between species diversity and genetic diversity within species. However, to maintain as much variability as possible, ecotype populations from contrasting habitats (altitude, longitude, etc.) and management practices should be considered, and diversity of floristic composition of the habitats could be used as an indicator to maximize diversity between populations of *F. pratensis*.

L. Horváth suggested that the difference in longevity between short-lived *L. multiflorum* and perennial *F. pratensis* might contribute to the contrasting behaviour of the two species.

Making information about *in situ* conservation accessible in databases

B. Boller raised the question of how information about *in situ* conserved accessions of ecotypes in multi-species plant communities could be made available in databases. He suggested using existing plant genetic resources databases, assigning accession numbers to individual species occurring in these *in situ* conservation areas. The feasibility of such an approach was questioned and I. Thomas suggested other possibilities for linking the information in relational databases.

Research activities

Current/recently terminated activities

Nordic project on timothy

Merja Veteläinen, Secretary General of the Nordic Joint Committee for Agricultural Research (NKJ), presented work carried out on phenotypic and molecular characterization of Nordic timothy (*Phleum pratense* L.) (<http://www.nordictimothy.net>). Partners in the project were from the Norwegian University of Life Sciences, Aarhus University, Denmark, Agricultural University of Iceland, Graminor, Norway, Boreal Plant Breeding Ltd., Finland, MTT Agrifood Research Finland, the Nordic Gene Bank (NGB) and the Swedish University of Agricultural Sciences.

The general goal was to enhance conservation and use of genetic resources of timothy and to develop new high-yielding and high-quality varieties. Specific aims will be to:

- analyze genetic variation of Nordic timothy germplasm in terms of distribution, dispersion history and important adaptive traits such as vernalization response and frost tolerance;
- evaluate how representative the current NGB accessions of timothy are in terms of genetic variability, and improve this by targeted collections and/or propose *in situ* conservation;
- use exotic germplasm to study the biogeographical history of Nordic timothy;
- broaden the genetic base of timothy breeding materials by identifying heterotic groups and sources (including exotic germplasm) for important traits, e.g. frost tolerance;
- define *in situ* conservation methods for old pastures and meadows; and
- improve the value and access of the NGB timothy collection by providing new phenotypic and genotypic data.

Two hundred accessions of timothy will be characterized phenotypically in the field and molecularly fingerprinted. All data collected will be included in the NGB database and made publicly available.

Completed research activities include the evaluation of Nordic *Festuca pratensis* and *Lolium perenne* collections.

Characterization of the Irish *Lolium perenne* collection of 1980

Susanne Barth presented her work on the diversity in a sub-sample of accessions from an Irish *Lolium perenne* collection from the early 1980s. Analyses of plastid diversity were made on 104 accessions (30 Irish ecotypes, 32 European/Near Eastern ecotypes, 16 commercial varieties, 11 other *Lolium* accessions, 9 *x Festulolium* accessions and 6 *Festuca* accessions).

It was found that the Irish accessions clustered together, but it was not possible to identify further geographical differentiation.

Variation in carbohydrates content was measured for 33 *L. perenne* accessions. Dry matter values in ecotypes were higher than in bred cultivars. A study was also carried out on the morphology variation for 50 *L. perenne* accessions (28 Irish ecotypes, 6 European ecotypes and 16 bred varieties). For vegetative traits, considerable variation was found within populations, but little variation between populations. Better values were found in commercial cultivars, but some European ecotypes also showed interesting traits. Ecotypes and varieties were clearly differentiated, as shown by principal component analysis (PCA), but no difference between Irish and European ecotypes could be detected.

B. Boller commented that he was surprised to see that Irish ecotypes did not seem to be separated from the cultivars in terms of plastid diversity, but that in phenotypic data they were separated.

S. Barth replied that additional nuclear data are expected to check whether the diversity patterns can be reconfirmed.

Possibilities of funding forage genetic resources research by European programmes: planning cooperative research activities and ways to generate funding

The group took note of the unsuccessful outcome of the project on "Building a European collection of *Medicago* – tailoring *Medicago* genetic resources for the 21st century", submitted to the EU for funding under Regulation EC 870/2004 (see above, Chair's report).

The opportunity offered by the 7th Framework Programme of the EU (<http://cordis.europa.eu/fp7/>) was mentioned. Although the programme is not directly targeted towards plant genetic resources, calls for proposals should be scrutinized for their potential.

S. Barth suggested considering the Marie Curie programme of the 7th Framework, which offers the possibility of funding complete PhD projects.

The following ideas for areas of collaborative research were proposed by the Group:

- Building on the ICONFORS project results, in order to answer the remaining questions on the most appropriate regeneration guidelines to be adopted.
- Building on the *Lolium* core collection project results, and find out how many accessions are needed in order to have a complete set of the variation existing in Europe for various forage crops.
- Broaden the perspective of the European forage databases and link them to the information systems of other regions of the world (USA, Australia, etc.).

A general remark was made about the frustration experienced by some partners in EU-funded projects, due to the high administrative burden that is attached to this funding source, and on the consequent reluctance to engage in new EU-funded projects.

Conclusion

Presentation of the report and adoption of recommendations

The report was discussed and agreed with a few amendments.

View of Forages WG relating to major topics for future Phase VIII of ECP/GR

The list of priority items suggested during the NCG meeting in Bonn, Germany, 29-31 March 2006, was revised and the Group agreed to maintain high priority on the following two items:

- Carry out primary MOS identification of primary holders with the remaining forage CCDBs for inclusion in the European forages collection.
- Support genebanks in making proposals to assign AEGIS accessions.

Regarding the issue of entering characterization and evaluation data in the databases and the creation of crop portals, this was considered an issue to be dealt with in conjunction with the relevant EPGRIS3 activity.

Activities on molecular characterization were dropped from the list of priorities.

It was agreed that the next meeting of the WG on Forages should be planned for 2010.

Selection of Chair and composition of the Network Coordinating Group

B. Boller expressed his pleasure at having served as the Chair of the Group for the past five years, but he announced that he needed to resign from this position now due to other commitments, such as chairing the EUCARPIA fodder section.

Merja Veteläinen was elected as new Chair of the Forages WG. She announced that the Network Coordinating Group will need to be redefined. The NCG members who were present at the meeting agreed to continue in this role, the other members will be approached by the Chair.

Closing remarks

B. Boller thanked Daniela Benediková, Jarmila Drobna, Pavel and René Hauptvogel, Maria Zaková and other staff from RIPP for the excellent and smooth organization of the meeting.

A social dinner was organized in a wine cellar restaurant, where the participants had the chance to taste different Slovakian wines.

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Appendix I. List of *Poa* accessions and their primary holders

INSTITUTE	ACCESSIONS	ORIGINALITY	PRIMCOLL	Confirmed as primary holder by Curator	Suggested as primary holder by DB manager	Missing confirmation	EFC candidates ⁶
POL022	2735	2735	2468		2468	2415 POL, 53 other countries	
DEU146, DEU271	793	793	514	487	27	other countries	110
SWE002	456	395	394	386	8	2 NLD, 6 SWE	
CZE082	236	236	236	236			34
HUN003	188	188	121		121	109 HUN, 12 other countries	
GBR016, GBR088	171	142	115	59	56	5 GBR, 51 other countries	
SVK001	279	279	276		276	168 SVK, 108 other countries	
BGR001	110	110	88	63	25	other countries	7
LTU001	145	145	145	145			93
NLD037	74	74	74	74			74
ITA363	37	37	36	36			
SVN019	22	22	22	22			
FRA- GEVES	17	17	17		17	14 FRA, 3 other countries	
LVA009	16	16	16	16			4
TUR001	13	13	13		13	all TUR	
CHE002	10	10	10	10			10
ROM003	7	7	7		7	all ROM	
BEL004	2	2	2	2			
Total	5311	5221	4554	1536	3018		332
%	100	98	86	29	57		6

⁶ Accessions are European Forage Collection (EFC) candidates, if the MOS accession is available, PRIMCOLL is defined and the accession is safety-duplicated.

Appendix II. Responsibilities for primary holders of forage accessions⁷

CCDB managers of *Dactylis*, *Festuca*, *Lolium*, *Medicago*, *Phleum*, *Poa* and *Trifolium* are in a position to make a proposal for “holders of primary collections”, even if their databases are not yet complete. The terms of responsibility of the maintainer of a Most Original Sample (MOS) were defined during the Seventh Meeting of the Working Group in Elvas, Portugal (1999) (see page 21 of the report) and are revised as follows:

- ensure that the accession is maintained under long-term conservation conditions in compliance with international standards and that preferred or acceptable seed increase guideline standards agreed within the Forages Working Group are followed;
- ensure that an appropriate safety-duplicate is deposited in a genebank, preferably within another ECPGR member country;
- facilitate access to the accessions to *bona fide* users;
- in case of it becoming impossible to honour the commitment for long-term conservation and regeneration, to inform the database manager.

Assumption of responsibility would have no legal basis, but would be considered as a voluntary contribution to the creation of a decentralized European Forage Collection (EFC). Only accessions for which responsibility is assumed by the primary holder can eventually be added to the EFC by scoring “yes” the EFC descriptor.

⁷ Adapted from page 9 in Boller, B., E. Willner, L. Maggioni and E. Lipman. 2006. Report of a Network Coordinating Group on Forages. *Ad hoc* Meeting, 21-22 April 2005, Lindau, Switzerland. International Plant Genetic Resources Institute, Rome, Italy. (Electronic version only, available at http://www.ecpgr.cgiar.org/Networks/Forages/Forages_Lindau_April2005.pdf)

Appendix III. Contact details of database managers

Genus	Species	CCDB	Manager	Email
Dactylis	<i>Dactylis glomerata</i>	<i>Dactylis</i>	Bartosz Tomaszewski	b.tomaszewski@ihar.bydgoszcz.pl
	Other <i>Dactylis</i> spp.	<i>Dactylis</i>		
Festuca	<i>Festuca pratensis</i>	<i>Festuca</i>	Bartosz Tomaszewski	b.tomaszewski@ihar.bydgoszcz.pl
	<i>Festuca rubra sensu lato</i>	<i>Festuca</i>		
	<i>Festuca arundinacea</i>	<i>Festuca</i>		
	Other <i>Festuca</i> spp.	<i>Festuca</i>		
Lolium	<i>Lolium perenne</i>	<i>Lolium</i>	Ian Thomas	ian.thomas@bbsrc.ac.uk
	<i>Lolium multiflorum</i>	<i>Lolium</i>		
	<i>Lolium x hybridum</i> (<i>boucheanum</i>)	<i>Lolium</i>		
	Other <i>Lolium</i> spp.	<i>Lolium</i>		
Medicago	<i>Medicago sativa</i>	Perennial <i>Medicago</i>	Jean-Paul Sampoux	jean-paul.sampoux@lusignan.inra.fr
	Other perennial <i>Medicago</i> spp.	Perennial <i>Medicago</i>		
	Annual <i>Medicago</i> spp.	Annual <i>Medicago</i>	Mónica Murillo	monica.murillo@juntaextremadura.net
Phleum	<i>Phleum pratense</i>	<i>Phleum</i>	Morten Rasmussen	morten.rasmussen@nordgen.org
	Other <i>Phleum</i> spp.	<i>Phleum</i>		
Poa	<i>Poa pratensis</i>	<i>Poa</i>	Evelin Willner	e.willner@so.hs-wismar.de
	Other <i>Poa</i> spp.	<i>Poa</i>		
Trifolium	<i>Trifolium pratense</i>	<i>Trifolium</i> <i>pratense</i>	Lajos Horváth	lhorvath@agrobot.rcat.hu
	<i>Trifolium repens</i>	<i>Trifolium</i> <i>repens</i>	Ian Thomas	ian.thomas@bbsrc.ac.uk
	<i>Trifolium subterraneum</i>	<i>Trifolium</i> <i>subterraneum</i>	Mónica Murillo	monica.murillo@juntaextremadura.net
	<i>Trifolium alexandrinum</i> / <i>resupinatum</i>	<i>Trifolium</i> <i>alexandrinum</i> / <i>resupinatum</i>	Israeli Genebank	no contact
	Other <i>Trifolium</i> spp.	No database defined		

Appendix IV. Description of the regeneration standards used for forage species

According to the recommendation of the meeting (see p. 17) the information previously published in the reports of the Linz (2003) and Lindau (2005) meetings was updated.

For some items of the regeneration procedure, the preferred/acceptable values have been indicated as follows:

Item of regeneration procedure	Preferred	Acceptable
site		
greenhouse/cabins (yes/no)	Insect pollinated crops: yes	
field/cages (yes/no)		
field/isolation with other crops (yes/no)	no	yes
insects as pollinator		
<i>natural</i> population / <i>commercial</i> product		
insect species (specify if known)		
crop used as isolation (specify; n.a. for cages)	rye	
isolation distance between plots (n.a. for cages)		
<i>length</i> (m)	Grasses: >30 m with an efficient barrier crop	Grasses: >60 m without an efficient barrier crop Insect-pollinated crops: >100 m
<i>width</i> (m)		>50 m
plants per accession (<i>number</i>)	100	30
distance between single plants		
scoring of traits:		
time of flowering (yes/no)		
others (specify)		
selection in accessions (yes / no) (elimination of other crop plants and weeds)	yes	
harvesting		
<i>once</i> / <i>several</i> (times)		
as <i>balanced</i> / <i>unbalanced</i> bulk or <i>separate seed</i> per each plant	>100 plants: unbalanced bulk <100 plants: harvest and store seeds of individual plants	bulk harvest
drying		
in <i>dry room</i> / <i>greenhouse</i> / using <i>drying equipment</i>	dry room	drying equipment
threshing and cleaning		
<i>manual</i> / <i>with machines</i>	manual	with machines
final drying		
<i>temperature, relative humidity</i> (specify)		
<i>final moisture content</i>	3-7%	
viability testing before storage (yes/no)	yes	
seed packaging and storage		
base collection	>100 plants: bulk <100 plants: per plant	bulk
active and duplicate collection	Bulk (if <100 plants: balanced)	bulk
information management	IT based	

Appendix V. Acronyms and abbreviations

AARI	Aegean Agricultural Research Institute, Izmir, Turkey
AEGIS	A European Genebank Integrated System
CCDB	Central Crop Database
CGN	Centre for Genetic Resources, Wageningen, The Netherlands
EA	European Accession
EC	European Community
ECCDB	European Central Crop Database
ECPGR	European Cooperative Programme for Plant Genetic Resources
EFC	European Forage Collection
EPDB	European <i>Poa</i> Database
EPGRIS	European Plant Genetic Resources Infra-Structure
EU	European Union
EUCARPIA	European Association for Research on Plant Breeding
EURISCO	European Internet Search Catalogue
GEVES	Groupe d'étude et de contrôle des variétés et des semences (Varieties and Seeds Study and Control Group), France
IGER	Institute of Grassland and Environmental Research, Aberystwyth, United Kingdom
ILVO	Instituut voor Landbouw- en Visserijonderzoek (Institute for Agricultural and Fisheries Research), Belgium
INRA	Institut National de la Recherche Agronomique (National Agronomic Research Institute), France
IPGR	Institute for Plant Genetic Resources "K. Malkov", Sadovo, Bulgaria
IPK	Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (Leibniz Institute of Plant Genetics and Crop Plant Research), Germany
LIA	Lithuanian Institute of Agriculture, Kedainiai, Lithuania
MAA	Most Appropriate Accession
MCPD	Multicrop passport descriptor
MOS	Most original sample
MoU	Memorandum of understanding
NCG	Network Coordinating Group (ECPGR)
NGB	Nordic Gene Bank, Alnarp, Sweden (<i>now Nordic Genetic Resource Center, NordGen</i>)
NKJ	Nordic Joint Committee for Agricultural Research
PGR	Plant genetic resources
RIFC	Research Institute for Fodder Crops Ltd., Troubsko, Czech Republic
RIPP	Research Institute of Plant Production, Piesťany, Slovakia
SC	Steering Committee
SIDT	Servicio de Investigación y Desarrollo Tecnológico (Technological Research and Development Service), Badajoz, Spain
WG	Working Group

Appendix VI. Agenda

Ninth meeting of the ECP/GR Working Group on Forages 23-25 October 2007, Piešťany, Slovakia

Monday 22 October 2007

Arrival of participants

Tuesday 23 October 2007

- 8:30 – 9:30** **1. Introduction**
- a) Welcome by local organizers (*Daniela Benediková*)
 - b) Self-introduction of participants and approval of agenda
 - c) Updates on ECPGR and AEGIS (*Lorenzo Maggioni*)
 - d) Working Group on Forages: Chairman's report (*Beat Boller*)
 - e) Aims and schedule of the meeting (*Beat Boller*)
- 9:30 - 10.30** **2. European Central Forages Databases**
- a) Role of European Central Forage Databases in relation to EURISCO (*Lorenzo Maggioni*)
 - b) Major advances in development of individual forage crop databases
 - Timothy database (*Petter Marum*)
 - *Agropyron* database (*Yana Guteva*)
- 10:30 – 11:00* *Coffee break*
- 11:00 – 12:30** **Reports on status of National Collections and collecting activities**
- 12:30 – 14:00* *Lunch break*
- 14:00 – 15:00** **Reports on status of National Collections and collecting activities (continued)**
- 15:00 – 15:30** **3. International cooperation**
- a) Reports on larger scale collecting activities, including partners of different countries
 - Joint Bulgaria-Japan and Bulgaria-Switzerland activities (*Yana Guteva*)
 - Joint Slovenia-Slovakia and Slovenia-Macedonia collecting missions (*Vladimir Meglič*)
 - Joint German-Czech collecting mission (*Evelin Willner*)
 - b) Practical considerations in application of Material Transfer Agreements
- 15:30 – 16:00* *Coffee break*
- 16:00 – 18:00** **4. Sharing of responsibilities**
- a) Progress of WG Workplan to define and verify "Originality" status, leading to the systematic definition of "Primary Holder" and eventual assignment of "European Forage Collection" status
 - Progress in the *Poa* database (*Evelin Willner*)
 - b) Modification of Workplan with respect to sharing of responsibilities for the remainder of Phase VII of ECP/GR: discussion and decisions
 - c) Safety-duplication

Wednesday 24 October 2007

- 8:30 – 10:30 **If needed, decision-making about item 5, sharing of responsibilities**
5. **Reconsidering minimum standards for regeneration**
- a) Summary of findings in project ICONFORS: Published results and conclusions (*Petter Marum and Maurice Hinton-Jones*)
 - b) Recommendations on modification of preferred and acceptable standards for regeneration: Discussion and decisions
- 10:30 - 11:00 *Coffee break*
- 11:00 - 11:30 **6. Core collections**
- a) Success stories of establishment of national or regional core collections
 - b) Suggestions for an approach to create European core collections for important species
- 12:30 - 14:00 *Lunch break*
- 14:00 - 16:00 **7. On-farm / in situ conservation**
- a) Landraces: Results of approaches to promote maintenance, use, or re-creation of landraces
 - Experience from the Nordic countries (*Merja Veteläinen*)
 - b) Ecotypes: concepts and approaches to identify sites for *in situ* conservation and to ensure their protection.
 - Geo-climatic structuring of fine-leaved fescues (*Jean-Paul Sampoux*)
 - Gene flow between wild and sown ryegrass (*Jean-Paul Sampoux*)
 - Habitats for *in situ* conservation of *Lolium multiflorum* and *Festuca pratensis* (*Beat Boller*)
 - c) How should information about *in situ* conserved accessions of ecotypes in multi-species plant communities be made available in databases
- 16:00 - 16:30 *Coffee break*
- 16:30 - 18:00 **8. Research activities**
- a) Current/recently terminated activities
 - Nordic project on timothy (*Merja Veteläinen*)
 - Characterization of the Irish *Lolium perenne* collection of 1980 (*Susanne Barth*)
 - Enhancement of *Vicia* germplasm in Georgia (*Avtandil Korakhashvili*)
 - b) Possibilities of funding forage genetic resources research by European programmes. Planning cooperative research activities and ways to generate funding
 - c) Possibilities of funding forage genetic resources projects as part of national "Plans of Action" to implement the "Global Plan of Action", following the Rio Convention on Biodiversity

Thursday, 25 October 2007

Drafting of the report. For those not involved a tour will be offered by the local organizers leaving at 8:30 from the hotel.

- 15:00 – 18:00 **9. Conclusion**
- a) Presentation of the report and adoption of recommendations
 - b) View of Forages WG relating to major topics for future Phase VIII of ECP/GR
 - c) Selection of Chair and composition of the Network Coordinating Group
 - d) Closing remarks

Friday 26 October 2007

Departure of participants

Appendix VII. List of participants

Ninth Meeting of the Working Group on Forages 23-25 October 2007, Piešťany, Slovakia

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